CURRENT NACA REPORTS

NACA Rept. 1141

METHOD AND GRAPHS FOR THE EVALUATION OF
AIR-INDUCTION SYSTEMS. George B. Brajnikoff.
1953. ii, 22p. diagrs., tab. (NACA Rept. 1141.
Formerly TN 2697)

Graphs that allow rapid evaluation of air-induction
systems from considerations of their aerodynamic
parameters in combination with power-plant charac-
teristics are presented for the supersonic Mach
numbers up to 3.0. Restrictions imposed by the
engine characteristics on the use of a fixed-size air
inlet are discussed and illustrated by means of
sample solutions. The relation between the engine
characteristics, flight conditions, inlet characteris-
tics, and inlet area for optimum performance is
given.

NACA Rept. 1142

DIFFUSION OF HEAT FROM A LINE SOURCE IN
ISOTROPIC TURBULENCE. Mahinder S. Uberoi
and Stanley Corrsin, Johns Hopkins University.
1953, ii, 29p. diagrs., photos., tab. (NACA
Rept. 1142. Formerly TN 2710)

An experimental and analytical study has been made
of some features of the turbulent heat diffusion be-
hind a line heated wire stretched perpendicular to a
flowing isotropic turbulence. The mean temperature
distributions have been measured with systematic
variations in wind speed, size of turbulence produc-
ing grid, and downstream location of heat source.
The nature of the temperature fluctuation field has
been studied. A comparison of Lagrangian and
Eulerian analyses for diffusion in a nondecaying tur-
bulence yields an expression for turbulent-heat-
transfer coefficient in terms of turbulence velocity
and a Lagrangian "scale." A convenient form has
been deduced for the criterion of interchangeability
of instantaneous space and time derivatives in a
flowing turbulence.

NACA TM 1365

PAPERS ON SHIMMY AND ROLLING BEHAVIOR OF
LANDING GEARS PRESENTED AT STUTTGART
CONFERENCE OCT. 16 AND 17, 1941. (Bericht über
die Sitzung Flattern und Rollverhalten von
Fahrwerken am 16./17. Oktober 1941 in Stuttgart).
August 1954. ii, 233p. diagrs., photos., 2 tabs.
(NACA TM 1365. Trans. from Lilienthal-
Gesellschaft für Luftfahrtforschung, Berlin,
Bericht 140)

This report is a compilation of 16 papers dealing
with landing gear behavior and tire characteristics
which were presented at a conference in Stuttgart in
1941. Four of these papers deal with the rolling
stability or veering-off tendency of nose and tail
wheel tricycle landing gears. Four others deal with
theoretical and experimental studies of the charac-
teristics of pneumatic tires including the side elas-
ticity, the cornering characteristics, and the force
distribution between tire and runway. The remain-
ing eight papers deal with theoretical and experi-
mental studies of wheel shimmy.

NACA RM 54G26

EFFECTS OF RESIN COATING METHODS AND
OTHER VARIABLES ON PHYSICAL PROPERTIES
OF GLASS-FABRIC REINFORCED POLYESTERS.
B. M. Axilrod, J. E. Wier and J. Mandel, National
Bureau of Standards. August 1954. 22p., 6 tabs.
(NACA RM 54G26)

Effects of resin coating methods on properties of
glass-fabric laminates with three finishes and two
polyester resins were investigated. Coating methods
were roller, use of dilute resin solution, resin im-
mersion, use of monomeric styrene, and vacuum
impregnation. A normal high-temperature rapid
cure and a moderate-temperature slow cure were
used. Laminate preparation followed a statistical
design to minimize uncontrollable variables. Tests
included flexural strength both dry and after water
immersion, specific gravity, resin content, and voids
content.

NACA RM E54F11

EXPERIMENTAL HEAT-TRANSFER AND FRICTION
COEFFICIENTS FOR AIR FLOWING THROUGH
STACKS OF PARALLEL FLAT PLATES. Eldon W.
Sams and Walter F. Weitand, Jr. August 1954. 33p.
diagrs., photo., tab. (NACA RM E54F11)

Forced-convection heat-transfer and pressure-drop
data were obtained for stacks of parallel flat plates of
short length-to-effective-diameter ratio. Two such
stacks were alined and misalined in the direction of
air flow with gap spacings between stacks of 1/32,
1/8, and 1/4 inch. Data were obtained with heat addi-
tion to the downstream stack only over a range of
Reynolds number from 15,000 to 80,000 and average
surface temperatures of about 680° R. The average
and local heat-transfer coefficients were only slightly
higher than predicted values from established round
tube data. The friction data for both stacks are com-
pared.

NACA RM E54F29

A STUDY OF THE RADIATION FROM LAMINAR
AND TURBULENT OPEN PROPANE-AIR FLAMES
AS A FUNCTION OF FLAME AREA, EQUIVALENCE
RATIO, AND FUEL FLOW RATE. Thomas P. Clark
and David A. Bittker. August 1954. 33p. diagrs.,
photos., 2 tabs. (NACA RM E54F29)

For laminar flames of given equivalence ratio, radia-
tion intensity changes linearly with fuel flow rate and
photographically measured surface area. Intensity
per unit area depends only on equivalence ratio.
Turbulent flame radiation intensity is also propor-
tional to fuel flow rate. Laminar and turbulent
flames at identical conditions of flow, equivalence
ratio, and burner diameter have about the same
radiation intensities. Furthermore, the spectral in-
tensity distributions appear to be the same for both
types of flame, suggesting that the kinetics may also
be the same. These results are compatible with the
"extended surface" concept of turbulent flame struc-
ture, but do not rule out other theories.

NACA RM E54F29a

SPARK IGNITION OF FLOWING GASES. IV -
THEORY OF IGNITION IN NONTURBULENT AND
TURBULENT FLOW USING LONG-DURATION
DISCHARGES. Clyde C. Swett, Jr. August 1954.
29p. diagrs., 2 tabs. (NACA RM E54F29a)

A theory of spark ignition is presented that is based
on the concept that only a portion of the discharge
length, a line source of ignition, is important in the
ignition process. Theoretical and experimental
comparisons of the energy in this heated zone reveal
a relation among the variables of total spark-
discharge energy, gas density and velocity, elec-
trode spacing, spark duration, intensity of turbu-
lence, and fuel constants. The limited data availa-
ble substantiate this relation.

NACA RM L54G02

RAPID ESTIMATION OF BENDING FREQUENCIES
OF ROTATING BEAMS. Robert T. Yntema.
August 1954. 18p. diagrs., tab. (NACA RM L54G02)

A procedure is presented in the form of charts which
permits the rapid estimation of the natural bending
frequencies of helicopter rotor blades both rotating
and nonrotating. Since the approach is based on the
Southwell equation, an evaluation of the method with
regard to such things as higher modes, blade offset,
and variable mass and stiffness distribution is also
given. The evaluation shows that when nonrotating
beam bending modes are used, the Southwell equation
yields reasonably accurate bending frequencies for
rotating helicopter blades. Example comparisons of
frequencies estimated using the charts with values
given by the manufacturer for several actual blades
show that the simplified procedure yields good practi-
cal results.

NACA TN 3197

MECHANICAL PROPERTIES AT ROOM TEMPERA-
TURE OF FOUR CERMETS OF TITANIUM CARBIDE
WITH NICKEL BINDER. Aldie E. Johnson, Jr.
August 1954. 22p. diagrs., photos., tabs. (NACA
TN 3197)

Room-temperature stress-strain curves are pre-
sented for compression, tension, and shear loadings
on four compositions of titanium carbide with nickel
binder. Values of ultimate strength, modulus of
elasticity, modulus of rigidity, Poisson's ratio in the
elastic region, density, and hardness for the four
materials are tabulated.

NACA TN 3206

TORSIONAL VIBRATIONS OF HOLLOW THIN-
WALLED CYLINDRICAL BEAMS. Edwin T.
Kruszewski and Eldon E. Kordes. August 1954. 33p.
diagrs., tab. (NACA TN 3206)

Theoretical analyses of the torsional vibrations of
hollow thin-walled cylinders are presented. Solu-
tions for beams of arbitrary doubly symmetrical
cross section with uniform wall thickness are given
for cantilever and free-free beam vibrations. Nu-
merical results are shown for cylinders of rectangu-
lar cross section and the influence of bending
stresses due to torsion and longitudinal inertia is
discussed. The solutions for beams of rectangular
cross section are used to investigate the accuracy of
a solution based on an analysis of a four-flange box
beam.

NACA TN 3212

A NONLINEAR THEORY OF BENDING AND BUCK-
LING OF THIN ELASTIC SHALLOW SPHERICAL
SHELLS. A. Kaplan and Y. C. Fung, California
Institute of Technology. August 1954. 58p. diagrs.,
photo., 5 tabs. (NACA TN 3212)

The problem of the finite displacement and buckling
of a shallow spherical dome is investigated both
theoretically and experimentally. Experimental re-
sults seem to indicate that the classical criterion of
buckling is applicable to very shallow spherical
domes for which the theoretical calculation was
made. A transition to energy criterion for higher
domes is also indicated.

NACA TN 3223

AN ANALYSIS OF SHOCK-WAVE CANCELLATION
AND REFLECTION FOR POROUS WALLS WHICH
OBEY AN EXPONENTIAL MASS-FLOW PRESSURE-
DIFFERENCE RELATION. Joseph M. Spiegel and
Phillips J. Tunnell. August 1954. 23p. diagrs.
(NACA TN 3223)

Conditions are derived for cancellation and reflec-
tion of two-dimensional shock waves from porous
walls with wall suction. An exponential relation be-
tween mass flow and pressure differential across the
walls is assumed. Applications to three-dimensional
shock waves are discussed.

NACA TN 3224

THEORETICAL INVESTIGATION OF THE EFFECTS
UPON LIFT OF A GAP BETWEEN WING AND BODY
OF A SLENDER WING-BODY COMBINATION. Duane
W. Dugan and Katsumi Hikido. August 1954. 41p.
diagrs. (NACA TN 3224)

Slender-body theory is applied to determine the effects upon-lift of a gap between wing and body of a slender wing-body combination. Two cases are considered, one in which the wing and body are both inclined at the same angle with respect to the free stream, the other in which the body remains at zero angle of attack and the wing is deflected with respect to the body.

NACA TN 3226

SOME POSSIBILITIES OF USING GAS MIXTURES OTHER THAN AIR IN AERODYNAMIC RESEARCH. Dean R. Chapman. August 1954. 48p. diagrs., 4 tabs. (NACA TN 3226)

A study is made of possible uses in compressible-flow research of various gas mixtures having the same specific-heat ratio as air. Such mixtures require low wind-tunnel power and have other possible applications in compressor research and firing-range research. Certain gas mixtures can be concocted which behave at wind-tunnel temperatures dynamically similar to air at flight temperatures.

NACA TN 3229

THE SMALL-DISTURBANCE METHOD FOR FLOW OF A COMPRESSIBLE FLUID WITH VELOCITY POTENTIAL AND STREAM FUNCTION AS INDE-PENDENT VARIABLES. Carl Kaplan. August 1954. 18p. (NACA TN 3229)

The equations of two-dimensional compressible flow are treated according to the Prandtl-Busemann small-disturbance method. In contrast to the usual procedure, the independent variables are the compressible velocity potential and stream function and the dependent variables are the rectangular Cartesian coordinates in the plane of flow. The six first-order differential equations corresponding to the first three iteration steps are put into complex-vector form. The particular integrals of the resulting set of three equations are then directly obtained. As an example, the general results of the analysis are applied to the case of subsonic compressible flow past a sinusoidal wall of small amplitude.

NACA TN 3232

AN ANALYSIS OF THE STABILITY AND ULTIMATE BENDING STRENGTH OF MULTIWEB BEAMS WITH FORMED-CHANNEL WEBS. Joseph W. Semonian and Roger A. Anderson. August 1954. 28p. diagrs., photos. (NACA TN 3232)

Design curves and procedures are presented for calculating the stresses at which wrinkling instability and failure occur in multiweb beams with formed-channel webs. The theory is compared with test data for multiweb beams in bending and a criterion is given for predicting whether a given beam will be susceptible to a wrinkling instability or will buckle in a local mode. The specification for riveting the web attachment flanges to the cover skins of the beams is shown to be an important factor in determining the ultimate strength of this type of construction.

NACA TN 3233

A REVIEW OF PLANING THEORY AND EXPERI-MENT WITH A THEORETICAL STUDY OF PURE-PLANING LIFT OF RECTANGULAR FLAT PLATES. Charles L. Shuford, Jr. August 1954. 34p. diagrs. (NACA TN 3233)

A summary is given of the background and present status of the pure-planing flat-plate lift theories. The fundamental assumptions and applicability to actual calculation of the planing lift force are reviewed. A proposed theory based on the considera-tion of linear lifting-line theory less the suction com-ponent of lift plus crossflow effects is presented. A comparison of this theory with existing planing for-mulas and experimental data is made. The agree-ment between the results calculated by the proposed theory and the experimental data is satisfactory for engineering calculations of pure-planing rectangular-flat-plate lift and center of pressure.

NACA TN 3234

REDUCTION OF HELICOPTER PARASITE DRAG. Robert D. Harrington. August 1954. 8p. diagrs. (NACA TN 3234)

A reduction in helicopter parasite drag is possible but not profitable except in those cases where high speed and long range are primary requirements. For some of the factors causing drag, reduction in parasite-drag area may result in increased weight whereas, in other cases, it does not. The final de-sign, however, must be a compromise between the reduction of drag and the increase in weight.

NACA TN 3236

WIND-TUNNEL STUDIES OF THE PERFORMANCE OF MULTIROTOR CONFIGURATIONS. Richard C. Dingeldein. August 1954. 10p. diagrs., photo. (NACA TN 3236)

The power requirements measured in static thrust and in level forward flight are presented for a co-axial and a tandem helicopter rotor configuration. The experimental measurements are compared with the results of calculations based on existing NACA single-rotor theory.

NACA TN 3237

HOVERING PERFORMANCE OF A HELICOPTER ROTOR USING NACA 8-H-12 AIRFOIL SECTIONS. Robert D. Powell, Jr. August 1954. 14p. diagrs., photos. (NACA TN 3237)

A helicopter rotor employing NACA 8-H-12 airfoil sections has been tested on the Langley helicopter test tower. Tests were made for two surface condi-tions, one within -0.002 inch of true airfoil contour and the other within -0.020 inch. The blades within 0.002 inch of true airfoil contour showed an average decrease of 6 to 7 percent in total torque coefficients.

NACA TN 3238

REVIEW OF INFORMATION ON INDUCED FLOW OF
A LIFTING ROTOR. Alfred Gessow. August 1954.
16p. diagrs., photo., tab. (NACA TN 3238)

A brief review of the available information relating
to rotor inflow is presented. The available material
is summarized in a table as to flight condition, type
of information, source, and the reference papers in
which the data can be found. Some representative
aspects of some of the reference material are dis-
cussed.

NACA TN 3239

SOME ASPECTS OF THE HELICOPTER NOISE
PROBLEM. Harvey H. Hubbard and Leslie W.
Lassiter. August 1954. 14p. diagrs., photo.
(NACA TN 3239)

Some aspects of the helicopter noise problem are
briefly discussed. These discussions deal with the
nature of the problem, some tentative criteria for use
in evaluating it, and the physical characteristics of
noise from helicopters. Overall noise data are pre-
sented for a reciprocating-engine helicopter along
with discussions of the characteristics of noise from
its various components such as the engine, gearing,
and rotors. Some consideration is also given to the
noise from tip jet rotor systems.

NACA TN 3241

AIRFOIL SECTION CHARACTERISTICS AT HIGH
ANGLES OF ATTACK. Laurence K. Loftin, Jr.
August 1954. 10p. diagrs. (NACA TN 3241)

Information from the literature and from recent in-
vestigations is used to summarize briefly the effects
of airfoil section parameters and flow variables on
the aerodynamic characteristics of symmetrical air-
foils at high angles of attack. The results indicate
that airfoil thickness ratio, Reynolds number, Mach
number, and surface roughness can all have an im-
portant effect on the maximum lift coefficient. Be-
yond the stall, changes in section thickness ratio
appear to have little effect on the aerodynamic char-
acteristics of airfoil sections.

NACA TN 3244

AERODYNAMIC CHARACTERISTICS OF THE NACA
64-010 AND 0010-1.10 40/1.051 AIRFOIL SECTIONS
AT MACH NUMBERS FROM 0.30 TO 0.85 AND
REYNOLDS NUMBERS FROM 4.0 x 10^6 TO 8.0 x 10^6.
Laurence K. Loftin, Jr. August 1954. 17p. diagrs.,
tab. (NACA TN 3244)

The results of a short two-dimensional investigation
to determine the aerodynamic characteristics of the
NACA 64-010 and 0010-1.10 40/1.051 airfoil sections
are presented. The investigation covered a Mach
number range from 0.30 to 0.85 and the correspond-
ing Reynolds number range extended from 4.0 x 10^6
to 8.0 x 10^6.

NACA TN 3253

SOME EFFECTS OF EXPOSURE TO EXHAUST-GAS
STREAMS ON EMITTANCE AND THERMOELECTRIC
POWER OF BARE-WIRE PLATINUM RHODIUM -
PLATINUM THERMOCOUPLES. George E. Glawe
and Charles E. Shepard. August 1954. 30p. diagrs.,
photos. (NACA TN 3253)

Thermocouples were exposed to exhaust gases from
the combustion of propane, 72-octane gasoline, and
JP-4 fuel. Exposure increased the emissivity of the
thermocouple wire, which increased its radiation
error. Two methods are presented for determining
the emittance of the wires. The emissivity of a
clean platinum rhodium - platinum thermocouple was
approximately 0.2 in the temperature range investi-
gated, while the emittance of an exposed thermocouple
coated with exhaust residue was about 0.5. The ex-
posure caused negligible change in the thermoelectric
power of the thermocouples.

NACA TN 3254

DETERMINATION OF FLAME TEMPERATURES
FROM 2000° TO 3000° K BY MICROWAVE ABSORP-
TION. Perry W. Kuhns. August 1954. 48p.
diagrs., photo., 2 tabs. (NACA TN 3254)

Equations are developed and a procedure is outlined
for obtaining flame temperatures from the attenua-
tion of microwaves by temperature-induced free
electrons. The electron-molecule collision fre-
quency and the effective ionization potentials of alkali
metals are found from the attenuation by a gaseous
burner flame in the region 1900° to 2400° K. Tem-
perature data of a liquid-propellent burner flame is
presented in the region 2200° to 2900° K.

NACA TN 3257

EFFECTS OF CHEMICALLY ACTIVE ADDITIVES
ON BOUNDARY LUBRICATION OF STEEL BY
SILICONES. S. F. Murray and Robert L. Johnson.
August 1954. 24p. diagrs., photos., tab. (NACA
TN 3257)

Conventional chemically active additives and more
active compounds such as peroxide were investigat-
ed. Conventional additives were not effective, but
more active materials such as the peroxide did give
effective lubrication. However, all the chemically
active-type additives were inferior to the solvent-
type additions such as the diesters previously
studied.

NACA TN 3258

INVESTIGATION OF MACH NUMBER CHANGES
OBTAINED BY DISCHARGING HIGH-PRESSURE
PULSE THROUGH WIND TUNNEL OPERATING
SUPERSONICALLY. Rudolph C. Haefeli and Harry
Bernstein. August 1954. 14p. diagrs., photos.,
tab. (NACA TN 3258)

A series of tests was performed to obtain an indica-
tion of the transient-flow phenomena caused by dis-
charging a chamber of high-pressure gas into a wind
tunnel operating supersonically. Two types of gust

were obtained; one had a maximum Mach number with a practically zero time duration whereas the other had a maximum Mach number with a finite time duration depending on the specific geometry. Such a test facility is applicable as a supersonic longitudinal-gust tunnel for producing transient boosts in Mach number.

NACA TN 3259

INVESTIGATION OF NICKEL-ALUMINUM ALLOYS CONTAINING FROM 14 TO 34 PERCENT ALUMINUM. W. A. Maxwell and E. M. Grala. August 1954. 42p. diagrs., photos., 7 tabs. (NACA TN 3259)

Alloys containing the intermetallics NiAl and Ni_3Al were prepared by casting. The melting practice developed was most important for the preparation of sound bodies. Room- and elevated-temperature strengths, ductilities, and susceptabilities to hot-rolling were determined. The 17.5-percent-aluminum alloy had the most outstanding properties and was studied in greatest detail. Creep-rupture strength at 1350° F, impact resistance, thermal shock behavior, oxidation resistance, and effects of thermal treatment on microstructure were determined for the 17.5-percent-aluminum alloy.

NACA TN 3261

A METHOD FOR EVALUATING THE EFFECTS OF DRAG AND INLET PRESSURE RECOVERY ON PROPULSION-SYSTEM PERFORMANCE. Emil J. Kremzier. August 1954. 21p. diagrs. (NACA TN 3261)

A method for evaluating the effects of inlet pressure recovery and drag on propulsion system thrust minus drag performance from consideration of engine over-all "pumping" characteristics is presented for air-breathing engines. The equations and curves presented facilitate the choice of inlet for maximum thrust minus drag. Illustrative examples of the use of the curves are also included.

NACA TN 3284

EXAMINATION OF THE EXISTING DATA ON THE HEAT TRANSFER OF TURBULENT BOUNDARY LAYERS AT SUPERSONIC SPEEDS FROM THE POINT OF VIEW OF REYNOLDS ANALOGY. Alvin Seiff. August 1954. 38p. diagrs., tab. (NACA TN 3284)

Experimental data from six investigations of the heat transferred by a turbulent boundary layer at supersonic speeds are studied to see whether or not they are well represented by the modified Reynolds analogy. The heat-transfer data are compared with the existing data on turbulent skin friction at supersonic speeds as affected by Mach number and wall temperature ratio. The effect of the wall temperature ratio on the data is emphasized.

BRITISH REPORTS

N-32409*

Forest Products Research Lab. (Gt. Brit.)
RADIO FREQUENCY AND OTHER HEATING PROCESSES. PROGRESS REPORT ELEVEN - APRIL, 1954. AGEING TESTS ON GLUED JOINTS CURED BY RADIO FREQUENCY HEATING. J. F. S. Carruthers and G. E. Soane. 4p. tab. (Forest Products Research Lab.)

Test specimens of glued beech plywood set by radio frequency glue line heating were tested by applying a splitting tool to each glue line and determining the maximum force required to force apart the laminations. The effect of five glues of the strength of the joints was investigated.

N-32431*

Aeronautical Research Council (Gt. Brit.)
EVAPORATION FROM THE SURFACE OF A BODY IN AN AIRSTREAM (WITH PARTICULAR REFERENCE TO THE CHEMICAL METHOD OF INDICATING BOUNDARY-LAYER TRANSITION). P. R. Owen and A. O. Ormerod. 1954. 42p. diagrs., 8 tabs. (ARC R & M 2875; ARC 14,604. Formerly RAE Aero 2431)

The problem of predicting the rate of transport of a gas from or into the surface of a two-dimensional body in an airstream is discussed. The principle object of the investigation is to provide a means of estimating the time required to obtain an experimental record of boundary-layer transition when a chemical technique is used. The methods evolved should, however, find an application to other forced diffusion phenomena.

N-32432*

Aeronautical Research Council (Gt. Brit.)
A REVIEW OF PORPOISING INSTABILITY OF SEAPLANES. A. G. Smith and H. G. White. 1954. 41p. diagrs., 5 tabs. (ARC R & M 2852; ARC 7741. Formerly MAEE H/Res/173)

A review has been made of the evidence on take-off and landing porpoising instability of seaplanes. The basic types of porpoising and their occurrence have been examined: full-scale results have been correlated with model-scale and theoretical results. Porpoising instability has been divided into three basic types, (a) forebody, (b) forebody-afterbody, and (c) step instability.

N-32433*

Aeronautical Research Council (Gt. Brit.)
SYMMETRIC FLUTTER CHARACTERISTICS OF A HYPOTHETICAL DELTA WING. D. L. Woodcock. 1954. 23p. diagrs. (ARC R & M 2839; ARC 13,378. Formerly RAE Structures 68)

This report considers the flutter characteristics of a hypothetical delta wing. It details the results of quaternary calculations showing the effect on the

reduced critical speed of the shapes and relative natural frequencies of the first two normal modes of the aircraft. From these results the stiffnesses necessary to avoid flutter are deduced for two forms of wing structure. The aerodynamic forces have been obtained by using two-dimensional derivatives multiplied by the cosine of the quarter-chord sweep-back in conjunction with strip theory applied to fore-and-aft strips. This procedure is of doubtful validity for the low aspect-ratio wing considered. With this reservation, however, the results confirm the adequacy of the present Ministry of Supply wing-stiffness requirement.

N-32434 *

Aeronautical Research Council (Gt.Brit.)
CHANGES IN CONTROL CHARACTERISTICS WITH CHANGES IN FLOW PATTERN AT HIGH SUBSONIC SPEEDS. TEST ON AN EC.1250 AEROFOIL WITH 25 PER CENT CONCAVE CONTROL FLAP, PARTS I AND II. R. A. Shaw. 1954. 32p. diagrs., photos., tab. (ARC R & M 2436. Formerly ARC 11,933; FM 1310; S & C 2264; 0.812; ARC 12,284)

This report describes results obtained in wind-tunnel tests where it was found that considerable changes in flow pattern and pressure distribution around an airfoil with control flap occurred in certain conditions for a small increase in speed or change in incidence or control angle. The changes were found first between M = 0.85 and 0.87, when the shock-stalled flow, which had developed at lower speeds, was replaced, on one surface only, by streamline flow extending almost to the trailing edge.

N-32435 *

Aeronautical Research Council (Gt. Brit.)
NOTES ON THE DYNAMIC RESPONSE OF AN AIR-CRAFT TO GUSTS AND ON THE VARIATION OF GUST VELOCITY ALONG THE FLIGHT PATH WITH SPECIAL REFERENCE TO MEASUREMENTS IN LANCASTER P. D. 119. Anne Burns. 1954. 18p. diagrs. (ARC R & M 2759; ARC 12,797. Formerly RAE Structures 47)

A collection of records showing the time histories of strains and accelerations at various parts of a Lancaster flying in clear turbulent air is presented and discussed. The records include specimens taken in cloud at moderate altitudes and in clear air at low altitudes. The amount of oscillation (funda-mental) excited by a gust appears to be affected by the variation of gust velocity across the span and the amount of oscillation excited does not appear to show any marked decrease as the airspeed of the aircraft is increased.

N-32436*

Aeronautical Research Council (Gt.Brit.)
AILERON REVERSAL AND WING DIVERGENCE OF SWEPT WINGS. E. G. Broadbent and Ola Mansfield. 1954. 26p. diagrs., 6 tabs. (ARC R & M 2817; ARC 11,148. Formerly RAE Structures 9)

A method of solution for the aileron reversal speed of a swept wing (with emphasis on sweepback) is developed on the lines of strip and semirigid

theories. The influence of the degree of sweep, wing torsional and flexural stiffness, wing plan form, and aileron plan form is investigated. Families of curves are given for extended variation of these parameters which may be used for the direct esti-mation of the reversal speed of a given wing by interpolation. A solution is given for the wing diver-gence speed of a swept wing.

N-32437 *

Aeronautical Research Council (Gt. Brit.)
NOTES ON THE INDUCED DRAG OF A WIND-TAIL COMBINATION. C. H. Naylor. 1954. 10p. diagrs., tab. (ARC R & M 2528. Formerly ARC 9974; Perf. 223)

An expression has been derived for the factor to be applied to ideal induced drag to allow for wing-tail interference. This factor is primarily dependent on the wing-tail lift and span ratios. It is of the order of 1:1 for a normal aircraft when the tailplane carries 10 percent of the weight of the aircraft, and can reach unexpectedly large values of high speed. Charts, generalized curves, and sufficient informa-tion are included to permit rapid evaluation of the factor for any particular case.

N-32438*

Aeronautical Research Council (Gt. Brit.)
WING PARACHUTES FOR RECOVERY FROM THE SPIN. PART I - GENERAL DESIGN REQUIRE-MENTS. G. E. Pringle and T. V. Somerville. PART II - WAKE PHENOMENA. D. J. Harper, J. R. Mitchell, J. Picken and G. E. Pringle. 1954. 10p. diagrs., tab. (ARC R & M 2543; ARC 8388; ARC 10,762. Formerly RAE Tech. Note Aero 1559; Tech. Note Aero 1881)

The wing parachutes of a tailless aircraft prototype failed to open when streamed in an accidental spin. This gave a clue to the existence of a marked wake effect when a parachute is deployed on a tow cable behind a stalled wing. The wake effect is such as to reduce the critical closing speed of the parachute. The effect measured in a wind tunnel diminishes as the cable is lengthened. It is recommended that the cables be made as long as possible up to 1-1/2 spans in length; here the danger of entanglement becomes real.

N-32439 *

Aeronautical Research Council (Gt.Brit.)
FURTHER EXPERIMENTS ON AN NACA 23021 AEROFOIL WITH A 15 PER CENT HANDLEY PAGE SLOTTED FLAP IN THE COMPRESSED AIR TUNNEL. R. Jones and A. H. Bell. 1954. 16p. diagrs., 6 tabs. (ARC R & M 2519. Formerly ARC 9864; Perf.206 S & C 2041)

The NACA 23021 airfoil was tested with a form of flap and slot which was modified by a rounding-off of the trailing edge of the main wing on the lower surface and of the leading edge of the flap, thus making the gap on the lower surface appreciably larger. The model was tested at R = 0.75 to 7.1×10^6 over the usual incidence range with flap

settings of 0° to 80°. The results are very similar to those obtained on an earlier model. An overall check of apparatus and model was obtained by closing the gap at 60° flap angle and repeating with satisfactory results some of the tests on the original model.

N-32440 *

Aeronautical Research Council (Gt. Brit.)
PUBLISHED REPORTS AND MEMORANDA OF THE AERONAUTICAL RESEARCH COUNCIL. 1954. 6p. (ARC R & M 2450)

N-32441 *

Aeronautical Research Council (Gt. Brit.)
STATIONARY RIG EXPERIMENTS ON THE HEAT EXTRACTING POWER OF CLOSED THERMO-SYPHON COOLING HOLES. H. W. Hahnemann. 1954. 44p. diagrs., tab. (ARC CP 152)

Information is given on heat flow in closed sodium-filled holes in turbine blades. The rig was a tube filled with fluid, transferring heat upwards by free convection from an electrically heated lower section to a water cooled upper section. The high Grashof numbers obtained in closed thermosyphon holes in actual turbine blades were approached by using tubes of large diameter, and measurements were made with mercury, water, and oil as the heat transporting fluid in order to cover a wide range of Grashof and Prandtl numbers. A formula correlating the results for the three different fluids was obtained.

N-32442 *

Aeronautical Research Council (Gt.Brit.)
THE INFLUENCE OF SURFACE WAVES ON THE STABILITY OF A LAMINAR BOUNDARY LAYER WITH UNIFORM SUCTION. D. A. Spence and D. G. Randall. 1954. 29p. diagrs. (ARC CP 161)

In order to estimate the destabilizing effect of waves likely to be encountered on wing surfaces which will be used with boundary layer suction, calculations have been made of the effect of small sinusoidal surface waves on the stability of the asymptotic suction profile. Curves are presented of the percentage increases in local suction flow, necessary to maintain the stability of the boundary layer at the same level as on a completely flat surface for various values of local suction flow, height: wave length ratio, and Reynolds number based on wave length. It is found that for the lower local suction flow or the larger height: wave length ratio the larger the necessary percentage increase in local suction flow.

N-32443 *

Aeronautical Research Council (Gt. Brit.)
THE MEASUREMENT OF POSITION ERROR AT HIGH SPEEDS AND ALTITUDE BY MEANS OF A TRAILING STATIC HEAD. K. W. Smith. 1954. 34p. diagrs., photo. (ARC CP 160)

The static position error of a service wing-tip leading edge pressure head installation has been measured on a Meteor VII by means of a trailing static head, developed especially for use at high speeds. These tests cover an altitude range from zero to 38,000 ft, and include measurements in "g" turns. The maximum Mach number reached was 0.84. For comparative purposes the static error was also measured at ground level by the aneroid method.

N-32444 *

Aeronautical Research Council (Gt. Brit.)
CALIBRATION OF THE R.A.E. NO. 18 (9 IN. x 9 IN.) SUPERSONIC WIND TUNNEL. PART I - PRELIMINARY INVESTIGATIONS. W. T. Lord and D. Beastall. 1954. 44p. diagrs., 6 tabs. (ARC CP 162)

A detailed account is given of the investigations performed in the RAE No. 18 (9-inch by 9-inch, continuous flow, variable density) supersonic wind tunnel prior to an extensive calibration of the tunnel. Variables which have an important effect on the behavior of the flow are discussed, and preliminary experiments to determine their significance are described. Results of the investigations serve to define the course of the complete calibration, and may provide a useful guide to future calibrations of similar supersonic tunnels. The calibration program is outlined: Part II will deal with tests at atmospheric stagnation pressure, and further tests at various stagnation pressures are proposed.

N-32445 *

Aeronautical Research Council (Gt. Brit.)
CALIBRATION OF THE R.A.E. NO. 18 (9 IN. x 9 IN.) SUPERSONIC WIND TUNNEL. PART II - TESTS AT ATMOSPHERIC STAGNATION PRESSURE. W. T. Lord, G. K. Hunt, R. J. Pallant and J. Turner. 1954. 24p. diagrs., 3 tabs. (ARC CP 163)

This report presents distributions of Mach number in the empty working section of the R.A.E. No. 18 (9-inch by 9-inch) supersonic wind tunnel at nominal Mach numbers of 1.4, 1.5, 1.6, 1.8, and 1.9, for condensation-free flow at atmospheric stagnation pressure and at a stagnation temperature of 35°. The major contributions to the nonuniformity of the flow are from the disturbances which arise from the junctions of the windows with the side walls of the tunnel. An indication of the boundaries of the working section for each Mach number is given.

N-32446 *

Aeronautical Research Council (Gt.Brit.)
TABULATION OF THE BLASIUS FUNCTION WITH BLOWING AND SUCTION. H. W. Emmons and D. C. Leigh. 1954. 81p. diagrs., 3 tabs. (ARC CP 157)

The present solutions cover the whole possible range of blowing and suction values. It was in connection with the solution of a combustion problem that the present solutions were obtained. Previous

calculations were given to four decimal places.
These hand computed tables generally agree to
better than 5 in the last place with the present one.
Calculations were done on the Electronic Delay
Storage Automatic Calculator.

MISCELLANEOUS

N-25500

EFFECTS OF ROUGHNESS AND SUCTION ON TRAN-
SITION FROM LAMINAR TO TURBULENT FLOW.
Hugh L. Dryden. 12p. diagrs. (Reprint from
Mémoires sur la Mécanique des Fluides, Ministére
de l'Air, Publications Scientifiques et Techniques,
p. 49-60, 1954)

The effect of roughness in reducing the gains attain-
able through the use of suction is described. Bound-
ary layer stability, theoretical results for boundary-
layer suction, effects of roughness on transition, ex-
perimental data on the effect of suction on transition,
and combined effects of roughness and suction are
topics included. It is concluded that only an exten-
sive program carefully planned in the light of our
present knowledge of roughness effects can settle
the question as to whether the theoretically predicted
stabilization of the flow can be obtained in practice.

NACA TN 2494

Errata No. 2 on "LIFT AND MOMENT ON
OSCILLATING TRIANGULAR AND RELATED WINGS
WITH SUPERSONIC EDGES." Herbert C. Nelson.
September 1951.

NACA TN 3184

Errata No. 1 on "BUCKLING OF LONG SQUARE
TUBES IN COMBINED COMPRESSION AND
TORSION AND COMPARISON WITH FLAT-PLATE
BUCKLING THEORIES." Roger W. Peters.
May 1954.

UNPUBLISHED PAPERS

N-29537*

Univ. of Minn., Institute of Technology.
THERMAL STRESSES IN BOX BEAMS - A THEO-
RETICAL AND EXPERIMENTAL STUDY OF
STRESSES IN ALUMINUM ALLOY BOX SECTIONS
UNDER GIVEN TEMPERATURE DISTRIBUTIONS.
Joseph A. Wise and Paul Andersen. January 1954.
130p. diagrs., photos. (Univ. of Minn., Institute
of Technology)

A theoretical and experimental study of stresses in
thin shell box sections due to thermal gradients is
presented. The basic theory is first developed for
plate-like sections then for box sections. Three

specimens were tested in an attempt to verify the
theory. It was concluded that the basic theory has
received some support from these tests, but much
more extended research is necessary to establish it
completely.

DECLASSIFIED NACA REPORTS

THE FOLLOWING REPORTS HAVE BEEN
DECLASSIFIED FROM CONFIDENTIAL,
8/18/54

    RM E9D08
    RM L7E15
    RM L7I01
    RM L8A28d
    RM L8F21
    RM L8G14
    RM L9C23
    RM L9H16a
    RM L9I28a

NACA RM A7J05

WIND-TUNNEL INVESTIGATION AT A MACH NUM-
BER OF 1.53 OF AN AIRPLANE WITH A TRIANGU-
LAR WING. Richard Scherrer and William R.
Wimbrow. January 23, 1948. 74p. diagrs.,
photos., 2 tabs. (NACA RM A7J05) (Declassified
from Confidential, 8/18/54)

Models of a tailless pursuit-type supersonic airplane
were tested in the Ames 1- by 3-foot supersonic wind
tunnel No. 1. The basic configuration and several
modifications were tested in pitch and yaw and with
deflections of the constant-chord control surfaces.
The control effectiveness was found to be independent
of angle of attack and was found to vary linearly with
control deflection. The variation of drag with lift
was small. All of the configurations tested were
longitudinally stable, but most were directionally
unstable.

NACA RM E8F07

DESIGN AND PERFORMANCE OF EXPERIMENTAL
AXIAL-DISCHARGE MIXED-FLOW COMPRESSOR.
II - PERFORMANCE OF IMPELLER. Ward W.
Wilcox. August 12, 1948. 21p. diagrs., photo.
(NACA RM E8F07) (Declassified from Confidential,
8/18/54)

Results are presented of preliminary tests on an
axial-discharge mixed-flow impeller that was de-
signed to combine the compactness, reliability, and
wide operating range of mixed-flow compressor with
high flow capacity per unit of frontal area that char-
acterizes the axial-flow compressors. At design
tip speed of 1480 feet per second, maximum flow
capacity of 18.7 pounds per second, peak adiabatic
efficiency of 0.78, and peak total-pressure ratio of
3.7 were obtained. Flow capacity per unit of frontal
area for this axial discharge impeller is much
greater than that of current commercial mixed-flow
compressors but is somewhat less than that for the
axial-flow compressors having the highest flow
capacity per unit frontal area.

NACA RM L7I04

PRELIMINARY TANK TESTS OF NACA HYDRO-
SKIS FOR HIGH-SPEED AIRPLANES. John R.
Dawson and Kenneth L. Wadlin. November 26, 1947.
19p. diagrs., photos. (NACA RM L7I04) (Declassi-
fied from Confidential, 8/18/54)

Contains results from tank landings and take-off tests
with a dynamic model of a hypothetical jet-propelled
airplane equipped with NACA hydro-skis. These re-
sults show stable take-offs and landings for the
model, although the resistance is high. The resis-
tance, which is not considered necessarily inherent,
appears to be acceptable for airplanes equipped with
rocket motors. It is concluded that hydro-skis suit-
able for flush retraction into streamline fuselages
offer a practicable means for taking off and landing
high-speed airplanes on the water.

NACA RM L7K14

FLIGHT TESTS TO DETERMINE THE EFFECT OF
AIRFOIL SECTION PROFILE AND THICKNESS
RATIO ON THE ZERO-LIFT DRAG OF LOW-
ASPECT-RATIO WINGS AT SUPERSONIC SPEEDS.
Ellis Katz. February 9, 1948. 19p. diagrs., photos.
(NACA RM L7K14) (Declassified from Confidential,
8/18/54)

Experimental determination of the zero-lift drag at
low supersonic speeds of low-aspect-ratio wings
with: (1) nonswept round-nose sections having vary-
ing degrees of thickness ratio from 0.03 to 0.09 and
(2) swept and nonswept wings having round-nose,
circular-arc, and diamond sections of 0.09 thickness
ratio.

NACA RM L7K24

HIGH-SPEED WIND-TUNNEL TESTS OF A 1/16-
SCALE MODEL OF THE D-558 RESEARCH AIR-
PLANE. BASIC LONGITUDINAL STABILITY OF
THE D-558-1. John B. Wright. May 12, 1948. 19p.
diagrs., tab. (NACA RM L7K24) (Declassified from
Confidential, 8/18/54)

This report contains the results of pitching-moment,
lift, and drag measurements with a 1/16-scale model
of the D-558-1, with no nose-inlet flow, with both the
tail removed and with the tail at a constant setting.
The tests were conducted through a Mach number
range up to 0.96 in the Langley 8-foot high-speed
tunnel. Only a limited analysis has been made. It
is indicated that the airplane can experience large
changes in static longitudinal stability beyond a Mach
number of 0.86. At a Mach number of 0.9 there is a
tendency for the airplane to become unstable at low
lift coefficients followed by large stable tendency at
higher speeds. A part of this change in stability is
indicated to be destabilizing effects from wing-
fuselage characteristics.

NACA RM L8A05

FLIGHT TESTS TO DETERMINE THE DRAG OF
FIN-STABILIZED PARABOLIC BODIES AT TRAN-
SONIC AND SUPERSONIC SPEEDS. Sidney R.
Alexander, Leo T. Chauvin and Charles B. Rumsey.
April 21, 1948. 24p. diagrs., photos. (NACA
RM L8A05) (Declassified from Confidential,
8/18/54)

Two fin-stabilized parabolic bodies of revolution of
fineness ratios 7.87 and 12 were flight tested over
the transonic and supersonic range. Curves of meas-
ured total drag coefficient plotted against Mach num-
ber are presented together with estimates of total
drag coefficient for several Mach numbers to indicate
the reasonable accuracy that can be expected from
such predictions. The tests also proved the effective-
ness of a simple "drag-separation" type booster
arrangement.

NACA RM L8A07

FREE-FLIGHT INVESTIGATION OF THE ROLLING
EFFECTIVENESS OF A WING-SPOILER ARRANGE-
MENT AT HIGH SUBSONIC, TRANSONIC, AND
SUPERSONIC SPEEDS. Carl A. Sandahl. May 17,
1948. 10p. diagrs., photo. (NACA RM L8A07)
(Declassified from Confidential, 8/18/54)

An investigation of the rolling effectiveness of a wing-
spoiler arrangement has been conducted by the use of
rocket-propelled test vehicles in free flight. The re-
sults obtained for the configuration tested, which
probably was not an optimum, indicated that rolling
effectiveness was a maximum at about $M = 0.91$,
decreased abruptly in the Mach number range from
0.92 to about 1.0, and continued to decrease with in-
creasing Mach number to the maximum attained
($M = 1.73$).

NACA RM L8A12

FORCE, STATIC LONGITUDINAL STABILITY, AND
CONTROL CHARACTERISTICS OF A 1/16-SCALE
MODEL OF THE BELL XS-1 TRANSONIC RE-
SEARCH AIRPLANE AT HIGH MACH NUMBERS.
Axel T. Mattson and Donald L. Loving. June 23,
1948. 49p. diagrs., tab. (NACA RM L8A12)
(Declassified from Confidential, 8/18/54)

This report contains results obtained to determine
the effects of compressibility at high Mach numbers
on a 1/16-scale model of the Bell XS-1 transonic re-
search airplane. These results are presented for
several model configurations through a Mach number
range from 0.4 to approximately 0.925. Presented in
the report are the lift, drag, and pitching-moment
variations with Mach numbers for angles of attack of
0° and 3° for various stabilizer incidences and
elevator deflections. The incremental drag, lift, and
pitching-moment characteristics are presented for a
fuselage speed retarder.

NACA RM L8A22

QUALITATIVE MEASUREMENTS OF RELATIVE
FLAP EFFECTIVENESS AT TRANSONIC SPEEDS
ON A SERIES OF FIVE THIN AIRFOILS WITH 25-
PERCENT-CHORD FLAPS AND VARIOUS AMOUNTS
OF SWEEPBACK. Harold L. Crane and Milton D.
McLaughlin. May 17, 1948. 24p. diagrs., photos.
(NACA RM L8A22) (Declassified from Confidential,
8/18/54)

Tests were made by the wing-flow method on a series
of 3-percent-thick models which had sweepback com-
binations of leading edge and flap hinge line ranging
from 0° to 45°. Full-span flaps were tested in all

cases, and, in addition, a half-span flap was tested on a 45° sweptback model. The Mach number range was from 0.5 to 1.1, and at M = 0.8 the Reynolds number range was approximately 700,000 to 1,500,000. The tests showed that the sweptback flaps were less effective but had a smaller decrease in effectiveness with speed. In no case was there an abrupt change in effectiveness or a complete loss of or reversal of effectiveness.

NACA RM L8A28

CURRENT STATUS OF LONGITUDINAL STABILITY. Charles J. Donlan. May 24, 1948. 16p. diagrs. (NACA RM L8A28) (Declassified from Confidential, 8/18/54)

The problems of static and dynamic longitudinal stability both at high speeds and at low speeds are discussed and data are presented which indicate recent progress made in the solution of these problems.

NACA RM L8A28b

DRAG MEASUREMENTS AT TRANSONIC SPEEDS OF TWO BODIES OF FINENESS RATIO 9 WITH DIFFERENT LOCATIONS OF MAXIMUM BODY DIAMETER. Jim Rogers Thompson and Max C. Kurbjun. July 22, 1948. 17p. diagrs., photos. (NACA RM L8A28b) (Declassified from Confidential, 8/18/54)

Contains total drag measurements by the free-fall method for two bodies of fineness ratio 9 with the maximum diameter located 16.7 percent ahead of and behind the body midpoint. The results are compared with those of previous tests to show the effect of location of maximum body diameter on drag between Mach numbers of 0.85 to 1.08 and to provide some information on the mechanism of the abrupt drag rise which occurs between Mach numbers of 0.95 and 1.00.

NACA RM L8A28e

LANDING CHARACTERISTICS OF HIGH-SPEED WINGS. Herbert A. Wilson, Jr. and Laurence K. Loftin, Jr. September 21, 1948. 21p. diagrs. (NACA RM L8A28e) (Declassified from Confidential, 8/18/54)

The results of investigations of the maximum lift characteristics of wings for airplanes designed to fly at transonic Mach numbers are summarized. It is concluded that maximum lift coefficients of about 1.3 to 1.6 can be obtained for wings of this type with the high-lift devices investigated, leading-edge flaps improve the characteristics of the wings, and the drag at high lifts is of importance in determining the landing characteristics.

NACA RM L8B03

LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF A SEMISPAN AIRPLANE MODEL AT TRANSONIC SPEEDS AS OBTAINED BY THE TRANSONIC-BUMP METHOD. Joseph Weil and M. Leroy Spearman. July 19, 1948. 23p. diagrs., tab. (NACA RM L8B03) (Declassified from Confidential, 8/18/54)

Tests were made using the transonic-bump method to determine the longitudinal stability and control characteristics in the transonic range of a semispan airplane model similar to a proposed research vehicle. A comparison was made with results obtained for the same model by the NACA wing-flow method. The model was mounted on a pivot and was free to trim at zero pitching moment. The lift coefficient and angle of attack for trim at various stabilizer settings were obtained for four center-of-gravity positions. The tests were made through a Mach number range from 0.60 to 1.20.

NACA RM L8B06

HIGH-SPEED WIND-TUNNEL TESTS OF A 1/16-SCALE MODEL OF THE D-558 RESEARCH AIRPLANE. D-558-1 SPEED-REDUCTION BRAKE AND SYMMETRICAL-PROFILE WING CHARACTERISTICS. John B. Wright. June 15, 1948. 22p. diagrs., tab. (NACA RM L8B06) (Declassified from Confidential, 8/18/54)

Contains a limited analysis of the results of pitching-moment, lift, and drag measurements with a 1/16-scale model of the D-558-1 through a Mach number range up to 0.96 in the Langley 8-foot high-speed tunnel. Tests of the model were made with speed-reduction brakes on the fuselage sides fully deflected. Tests were also made with the model (without brakes) utilizing a wing of symmetrical profile. Included for comparison are data for the model without the brakes and for the model with a cambered wing.

NACA RM L8B18

TANK SPRAY TESTS OF A JET-POWERED MODEL FITTED WITH NACA HYDRO-SKIS. Kenneth L. Wadlin and John A. Ramsen. July 22, 1948. 19p. diagrs., photos. (NACA RM L8B18) (Declassified from Confidential, 8/18/54)

Contains tank results of take-off tests with a powered dynamic model of a hypothetical jet-propelled high-speed airplane, fitted with NACA hydro-skis, and having flush turbojet intakes on the upper part of the fuselage near the nose. It was concluded that take-offs can be made without spray entering the intakes by using very small longitudinal strips. The tendency of the turbojet air inflow to draw spray into the intakes is slight. Jet power increased trims during the high-speed part of the take-off run.

NACA RM L8B19

LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF A SEMISPAN AIRPLANE MODEL WITH A SWEPTBACK WING AND TAIL FROM TESTS AT TRANSONIC SPEEDS BY THE NACA WING-FLOW METHOD. Richard H. Sawyer and Lindsay J. Lina. July 23, 1948. 42p. diagrs., photos., tab. (NACA RM L8B19) (Declassified from Confidential, 8/18/54)

The angle of attack and lift coefficient obtained under trimmed (zero pitching-moment) conditions with fixed controls are presented for Mach numbers from 0.50 to 1.07 for a semispan airplane model having a 45° sweptback wing and tail. The effects of

Reynolds number and the effectiveness of a wing flap similar to a dive-recovery flap on a straight wing also were investigated briefly. Comparison is made with previous tests of the model equipped with, first, an unswept wing and tail and, second, with an unswept wing and sweptback tail.

NACA RM L8B26

PRELIMINARY FREE-FLIGHT INVESTIGATION OF THE EFFECT OF AIRFOIL SECTION ON AILERON ROLLING EFFECTIVENESS AT TRANSONIC AND SUPERSONIC SPEEDS. Carl A. Sandahl. June 25, 1948. 6p. diagrs. (NACA RM L8B26) (Declassified from Confidential, 8/18/54)

Results have been obtained by means of a free-flight technique utilizing rocket propulsion which indicate that aileron-rolling-effectiveness characteristics are affected adversely by variations in airfoil section which produce large increases in the trailing-edge angle.

NACA RM L8C23

HIGH-SPEED WIND-TUNNEL TESTS OF A 1/16-SCALE MODEL OF THE D-558 RESEARCH AIRPLANE. LONGITUDINAL STABILITY AND CONTROL OF THE D-558-1. John B. Wright. July 8, 1948. 47p. diagrs., tab. (NACA RM L8C23) (Declassified from Confidential, 8/18/54)

This paper contains the results of pitching-moment and lift measurements with a 1/16-scale model of the D-558-1, with no nose-inlet flow, and at several stabilizer and elevator settings. The tests were conducted up to a Mach number of 0.96 in the Langley 8-foot high-speed tunnel. Only a limited analysis of the various stability and control parameters is presented.

NACA RM L8C25

AERODYNAMIC LOSSES IN LOW-PRESSURE TAIL-PIPE EXHAUST DUCTS FOR ROCKET-PROPELLED AIRCRAFT. W. K. Hagginbothom and J. G. Thibodaux. July 20, 1948. 15p. diagrs., photos. (NACA RM L8C25) (Declassified from Confidential, 8/18/54)

An evaluation of the aerodynamic losses involved in the use of exhaust ducts for rocket-propelled aircraft was obtained from thrust stand tests. The aerodynamic losses created by the use of low-pressure tailpipe exhaust ducts for rocket-propelled aircraft are within practical limits insofar as overall propulsion requirements for pilotless-aircraft models are concerned.

NACA RM L8D21

PRELIMINARY INVESTIGATION OF VARIOUS AILERONS ON A 42° SWEPTBACK WING FOR LATERAL CONTROL AT TRANSONIC SPEEDS. Thomas R. Turner, Vernard E. Lockwood and Raymond D. Vogler. September 7, 1948. 35p. diagrs., photo. (NACA RM L8D21) (Declassified from Confidential, 8/18/54)

Contains the rolling-moment characteristics for a reflection-plane model with 42.8° leading-edge sweep, aspect ratio 4.0, and taper ratio 0.50 for several aileron configurations (chord and contour change) in the transonic speed range. The paper also includes some rolling-moment characteristics for spoilers, wing-tip aileron, and leading-edge flaps through the transonic speed range at Mach numbers from 0.5 to 1.15.

NACA RM L8E14

LIMITED MEASUREMENTS OF STATIC LONGITUDINAL STABILITY IN FLIGHT OF DOUGLAS D-558-1 AIRPLANE (BUAERO NO. 37971). Walter C. Williams. June 24, 1948. 10p. diagrs., photos., tab. (NACA RM L8E14) (Declassified from Confidential, 8/18/54)

Contains a few measurements of the variation of elevator angle and elevator force with Mach number at 30,000 feet altitude up to a Mach number of 0.85. These data show that the airplane possessed positive static longitudinal stability up to a Mach number of 0.80. A trim change in the nose-down direction occurred for Mach numbers above 0.82.

NACA RM L8E14a

FLIGHT MEASUREMENT OF THE STABILITY CHARACTERISTICS OF THE DOUGLAS D-558-1 AIRPLANE (BUAERO NO. 37971) IN SIDESLIPS. Walter C. Williams. April 18, 1949. 23p. diagrs., photos. (NACA RM L8E14a) (Declassified from Confidential, 8/18/54)

Measurements have been made of the stability characteristics of the D-558-1 airplane in steadily increasing sideslips at various Mach numbers from 0.50 to 0.80 at 10,000 feet altitude and at Mach numbers from 0.50 to 0.84 at 30,000 feet altitude. The results of these tests show that the apparent directional stability of the airplane is high and increases with increasing Mach number and dynamic pressure. The dihedral effect is positive at all speeds, there is little or no change in pitching moment with sideslip, and the cross-wind force is positive.

NACA RM L8E27

FLIGHT TESTS OF A TWO-DIMENSIONAL WEDGE DIFFUSER AT TRANSONIC AND SUPERSONIC SPEEDS. M. A. Faget. August 11, 1948. 21p. diagrs., photos. (NACA RM L8E27) (Declassified from Confidential, 8/18/54)

A two-dimensional wedge diffuser suitable for use in a ducted-airfoil ram jet was flight tested. Test results at flight speeds from M = 0.7 to M = 1.4 are presented. A velocity survey at the exit of the diffuser showed a large wake effect from the island which was faired behind the central wedge. Curves showing diffuser-exit Mach numbers, velocity, pressure, and mass flow are all smooth throughout the transonic region indicating the diffusion process to be fairly insensitive to passage through the transonic region.

NACA RM L8F24

APPLICATION OF ONE PART OF VON KARMAN'S
TWO-DIMENSIONAL TRANSONIC SIMILARITY LAW
TO DRAG DATA OF NACA 65-SERIES WINGS.
Kenneth B. Amer. August 24, 1948. 9p. diagrs.
(NACA RM L8F24) (Declassified from Confidential,
8/18/54)

Application of one part of Von Kármán's two-
dimensional transonic similarity law to drag data of
wings having NACA 65-006, 65-009, and 65_1-012
profiles and aspect ratios of 7.6 in the transonic
range shows satisfactory correlation. The presence
of various factors in the flow which were not con-
sidered in the derivation of the law from the potential
flow equation did not appreciably affect the degree of
correlation.

NACA RM L8G29a

DETERMINATION BY THE FREE-FALL METHOD
OF THE LONGITUDINAL STABILITY AND CONTROL
CHARACTERISTICS OF A 1/4-SCALE MODEL OF
THE BELL XS-1 AIRPLANE AT TRANSONIC
SPEEDS. James T. Matthews, Jr. and Charles W.
Mathews. November 9, 1948. 19p. diagrs.,
photo., tab. (NACA RM L8G29a) (Declassified
from Confidential, 8/18/54)

Report presents results of a free-fall test to deter-
mine longitudinal stability and control character-
istics of a 1/4-scale model of the Bell XS-1 airplane.
The model attained a Mach number of 0.98. Time
histories given show variations of elevator position,
normal and transverse accelerations, longitudinal
retardation, and Mach number throughout the fall.
Variations with Mach number of lift coefficient, drag
coefficient, and lift-to-drag ratio are also presented.
Observations on and explanations of the behavior of
the model are included.

NACA RM L8G30

LONGITUDINAL STABILITY AND CONTROL
CHARACTERISTICS OF A SEMISPAN MODEL OF A
SUPERSONIC AIRPLANE CONFIGURATION AT
TRANSONIC SPEEDS FROM TESTS BY THE NACA
WING-FLOW METHOD. Norman S. Silsby and
James M. McKay. November 8, 1948. 30p.
diagrs., photos., tab. (NACA RM L8G30)
(Declassified from Confidential, 8/18/54)

The investigation was made by the NACA wing-flow
method of the longitudinal stability and control char-
acteristics in the transonic range of a semispan
model of a supersonic airplane configuration having
a long slender fuselage and straight wing and tail
with faired double-wedge airfoil sections 4.6 percent
thick, aspect ratio 4.0, and taper ratio 2.

NACA RM L8H05

HIGH-SPEED WIND-TUNNEL TESTS OF A 1/16-
SCALE MODEL OF THE D-558 RESEARCH AIR-
PLANE - DYNAMIC PRESSURE AND COMPARISON
OF POINT AND EFFECTIVE DOWNWASH AT THE
TAIL OF THE D-558-1. Harold L. Robinson.
November 4, 1948. 27p. diagrs. (NACA RM L8H05)
(Declassified from Confidential, 8/18/54)

The results indicate that the downwash changes that
occur at the tail location of the D-558-1 airplane are
not the cause for the instability reported in previous
papers. The tests include a Mach number range of
0.40 to 0.94 and a lift-coefficient range of -0.3 to 0.7.
The rate of change of point downwash with lift coeffi-
cient decreases at high speeds and low lift coefficient,
thus causing a stabilizing effect. The appendices of
this paper give a method of correlating stability with
downwash and also give a method of including tail
drag when measuring downwash by the tail-on and
tail-off methods.

NACA RM L8H06a

EFFECT OF DOWNWASH ON THE ESTIMATED
ELEVATOR DEFLECTION REQUIRED FOR TRIM
OF THE XS-1 AIRPLANE AT SUPERSONIC SPEEDS.
James T. Matthews, Jr. November 1, 1948. 11p.
diagrs. (NACA RM L8H06a) (Declassified from
Confidential, 8/18/54)

Contains estimation of elevator deflections required
for trim at supersonic speeds of the XS-1 including
the effect of downwash determined from linearized
theory. Results indicate that increasing up-elevator
deflection is required in level flight as the Mach
number increases from 1.1 to about 1.6 with a slight
reduction of up elevator occurring between 1.6 and
2.0. The reasons for these trends have been ana-
lyzed and are presented in the paper.

NACA RM L8I23

ADDITIONAL FREE-FLIGHT TESTS OF THE ROLL-
ING EFFECTIVENESS OF SEVERAL WING-SPOILER
ARRANGEMENTS AT HIGH SUBSONIC, TRANSONIC,
AND SUPERSONIC SPEEDS. H. Kurt Strass.
November 24, 1948. 16p. diagrs., photos. (NACA
RM L8I23) (Declassified from Confidential,
8/18/54)

Additional results of an aerodynamic-control-
effectiveness investigation using free-flight, rocket-
propelled test vehicles have been obtained recently
which show some results of chordwise spoiler loca-
tion and a comparison of a sharp-edge spoiler with
a wedge-type spoiler at the 0.8-chord location and a
plain, full-span, 0.2-chord aileron with a deflection
equal to 4.4°.

NACA RM L8J21

THE EFFECT OF AIR JETS SIMULATING CHINES
OR MULTIPLE STEPS ON THE HYDRODYNAMIC
CHARACTERISTICS OF A STREAMLINE FUSELAGE.
Bernard Weinflash. January 7, 1949. 37p. diagrs.,
photos., 2 tabs. (NACA RM L8J21) (Declassified
from Confidential, 8/18/54)

Preliminary tests were made to determine the effect
of forced ventilation on the hydrodynamic character-
istics of a streamline fuselage of a hypothetical tran-
sonic airplane. This forced ventilation consisted of
air ejected at about 300 feet per second through small
orifices distributed over the fuselage bottom in vari-
ous patterns simulating chines and/or multiple steps.
Data are presented on the resistance, trim, and ef-
fective hydrodynamic lift for the basic model and for

each of the jet configurations. All of the jet configurations caused appreciable improvement in hydrodynamic performance, especially at higher speeds.

NACA RM L8K01

EFFECT OF WING SWEEP, TAPER, AND THICKNESS RATIO ON THE TRANSONIC DRAG CHARACTERISTICS OF WING-BODY COMBINATIONS. Jim Rogers Thompson and Charles W. Mathews. December 31, 1948. 29p. diagrs., photos., 2 tabs. (NACA RM L8K01) (Declassified from Confidential, 8/18/54)

Contains free-fall measurements of the transonic drag characteristics of three wing-body combinations having 35^0 sweptback wings with thickness ratios of 0.09 and 0.12 and taper ratios of 1:1 and 1.467:1. Results are compared with measurements for four related configurations reported previously and with theoretical calculations to show the effects of wing sweep, taper, and thickness ratio on the transonic drag characteristics of wing-body combinations and their component parts.

NACA RM L8K02

AERODYNAMIC CHARACTERISTICS AT SUBSONIC AND TRANSONIC SPEEDS OF A 42.7^0 SWEPTBACK WING MODEL HAVING AN AILERON WITH FINITE TRAILING-EDGE THICKNESS. Thomas R. Turner, Vernard E. Lockwood and Raymond D. Vogler. January 12, 1949. 24p. diagrs., photo. (NACA RM L8K02) (Declassified from Confidential, 8/18/54)

This paper contains the aerodynamic characteristics for a reflection-plane model having 42.7^0 leading-edge sweep, an aspect ratio of 4.0, and a taper ratio of 0.50 with an aileron of various finite trailing-edge thicknesses. The aerodynamic characteristics which include aileron rolling moments were obtained through the transonic-speed range from a Mach number of 0.5 to 1.15. The tests were performed in transonic flow over a bump on the tunnel floor and in subsonic flow on one of the tunnel side walls.

NACA RM L8K03

STABILITY RESULTS OBTAINED WITH DOUGLAS D-558-1 AIRPLANE (BUAERO NO. 37971) IN FLIGHT UP TO A MACH NUMBER OF 0.89. William H. Barlow and Howard C. Lilly. April 22, 1949. 16p. diagrs., photos. (NACA RM L8K03) (Declassified from Confidential, 8/18/54)

Contains flight measurements of trim characteristics in straight flight for two stabilizer settings for D-558-1 airplane up to a Mach number of 0.89. Also shows elevator angle per unit normal-force coefficient and elevator control force per unit acceleration up to a Mach number of 0.82. The buffet boundary is well defined up to a Mach number of 0.84 and is shown in comparison with that of the XS-1 airplane with the same wing section, 65-110.

NACA RM L8K23a

THEORETICAL ANALYSIS OF THE ROLLING MOTIONS OF AIRCRAFT USING A FLICKER-TYPE AUTOMATIC ROLL STABILIZATION SYSTEM HAVING A DISPLACEMENT-PLUS-RATE RESPONSE. Howard J. Curfman, Jr. January 12, 1949. 29p. diagrs., 2 tabs. (NACA RM L8K23a) (Declassified from Confidential, 8/18/54)

A general analysis of the steady-state rolling oscillations of aircraft using the displacement-plus-rate response, flicker-type automatic roll stabilization system is presented, and charts are included for finding the amplitude and period of these oscillations for any aircraft. The addition of the rate-sensitive element to the displacement-response, flicker-type system reduces the amplitude and increases the frequency of the steady-state oscillations. Current trends in pilotless-aircraft designs indicate that small amplitude residual oscillations are possible. The analysis shows close agreement with roll-simulator tests.

NACA RM L8K29

AN INVESTIGATION OF AILERON OSCILLATIONS AT TRANSONIC SPEEDS ON NACA 23012 AND NACA 65-212 AIRFOILS BY THE WING-FLOW METHOD. Harold L. Crane. December 29, 1948. 9p. diagrs., photo. (NACA RM L8K29) (Declassified from Confidential, 8/18/54)

An investigation is being conducted to determine the feasibility of studying aileron buzz by means of the wing-flow method. Two semispan models which had an aspect ratio of 6 and a taper ratio of 2 with quarter-chord half-span mass-balanced ailerons have been used. One had an NACA 23012 airfoil section and the second, an NACA 65-212 airfoil section. The ailerons on both models were subject to buzz over a small range of Mach number near 0.9. Data obtained by wing-flow testing agreed reasonably well with full-scale flight results.

NACA RM L8L07

ESTIMATION OF LIFT AND DRAG OF AIRFOILS AT NEAR SONIC SPEEDS AND IN THE PRESENCE OF DETACHED SHOCK WAVES. John P. Mayer. February 23, 1949. 23p. diagrs. (NACA RM L8L07) (Declassified from Confidential, 8/18/54)

A semiempirical method of estimating the forces on airfoils at near sonic speeds and in the presence of detached shock waves is presented. Fairly good agreement with the trend of existing experimental data is found at Mach numbers from 0.95 to 2.3 for sharp-nose airfoils at speeds and angles of attack above those at which shock detachment occurs and for blunt-nose airfoils where shock waves always are detached. Computed values of the forces on two-dimensional wings are in good agreement with wind-tunnel data on three-dimensional wings at high angles of attack. The approximate method is in agreement with Von Kármán transonic similarity laws.

NACA RM L9J12
National Advisory Committee for Aeronautics.
LOW-SPEED STATIC LATERAL STABILITY CHAR-
ACTERISTICS OF A CANARD MODEL HAVING A
60° TRIANGULAR WING AND HORIZONTAL TAIL.
William R. Bates. November 23, 1949. 29p.
diagrs., tab. (NACA RM L9J12) (Declassified
from Confidential, 8/18/54)

Contains results of force tests and flow surveys made
in the Langley free-flight tunnel to determine the
stability characteristics of a canard model having
60° triangular plan-form wing and horizontal tail.
Tests were made with the horizontal tail used as a
fixed nose elevator or floating freely at various tab
deflections. Various vertical-tail configurations
were also studied. Unusual directional stability
characteristics were obtained from the results.

NACA RM L9J28

LOW-SPEED INVESTIGATION OF DEFLECTABLE
WING-TIP AILERONS ON AN UNTAPERED 45°
SWEPTBACK SEMISPAN WING WITH AND WITHOUT
AN END PLATE. Jack Fischel and James M.
Watson. December 14, 1949. 32p. diagrs., photo.
(NACA RM L9J28) (Declassified from Confidential,
8/18/54)

Contains results and discussion of a low-speed in-
vestigation of triangular- and parallelogram-plan-
form deflectable wing-tip ailerons on an untapered
45° sweptback semispan wing with and without a
rectangular end plate (simulating a vertical fin)

mounted on the wing inboard of the ailerons. Lift
and lateral-control data were obtained through a
large angle-of-attack range and a large aileron-
deflection range for each aileron plan form on the
plain wing and the wing with end-plate. Aileron plan
form had little or no effect, whereas the end plate
had measurable effect on lift, drag, and rolling-
moment data. These ailerons should provide ade-
quate control over the entire angle-of-attack range.

NACA RM L9K10a

AERODYNAMIC CHARACTERISTICS OF A WING
WITH QUARTER-CHORD LINE SWEPT BACK 35°,
ASPECT RATIO 6, TAPER RATIO 0.6, AND NACA
65A006 AIRFOIL SECTION. TRANSONIC-BUMP
METHOD. William C. Sleeman, Jr. and William D.
Morrison, Jr. December 12, 1949. 32p. diagrs.,
photos., tab. (NACA RM L9K10a) (Declassified
from Confidential, 8/18/54)

This paper presents the results of an investigation by
the transonic-bump method of a wing-fuselage combi-
nation employing a 35° sweptback wing with aspect
ratio 6, taper ratio 0.6, and an NACA 65A006 airfoil
section. Lift, drag, pitching moment, and root
bending moment were obtained for the wing-alone and
wing-fuselage configurations over a Mach number
range of 0.60 to 1.18. Effective downwash angles and
dynamic-pressure characteristics in the region of a
probable tail location were also obtained and are pre-
sented for a range of tail heights at one tail length.

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